


# PATENT COOPERATION TREATY

# PCT

## INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>CC7 2004004PCT</b>	<b>FOR FURTHER ACTION</b>		See Form PCT/PEA/416
International application No. <b>PCT/EP2005/000098</b>	International filing date (day/month/year) <b>10.01.2005</b>	Priority date (day/month/year) <b>09.01.2004</b>	
International Patent Classification (IPC) or national classification and IPC <b>G01T3/06</b>			
Applicant <b>STICHTING VOOR DE TECHNISCHE WETENSCHAPPEN et al.</b>			
1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36. 2. This REPORT consists of a total of 5 sheets, including this cover sheet. 3. This report is also accompanied by ANNEXES, comprising: a. <input type="checkbox"/> sent to the applicant and to the International Bureau a total of     sheets, as follows: <input type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions). <input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box. b. <input type="checkbox"/> (sent to the International Bureau only) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).			
4. This report contains indications relating to the following items: <input checked="" type="checkbox"/> Box No. I     Basis of the opinion <input type="checkbox"/> Box No. II    Priority <input type="checkbox"/> Box No. III   Non-establishment of opinion with regard to novelty, inventive step and industrial applicability <input type="checkbox"/> Box No. IV    Lack of unity of invention <input checked="" type="checkbox"/> Box No. V     Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement <input type="checkbox"/> Box No. VI    Certain documents cited <input type="checkbox"/> Box No. VII    Certain defects in the international application <input checked="" type="checkbox"/> Box No. VIII   Certain observations on the international application			
Date of submission of the demand  <b>17.03.2005</b>	Date of completion of this report  <b>05.12.2005</b>		
Name and mailing address of the international preliminary examining authority:  <b>European Patent Office          D-80298 Munich          Tel. +49 89 2399 - 0 Tx: 523656 epmu d          Fax: +49 89 2399 - 4465</b>		Authorized Officer  <b>Doslik, N</b>  Telephone No. +49 89 2399-	



**INTERNATIONAL PRELIMINARY REPORT  
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International application No.  
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**Box No. I Basis of the report**

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1. With regard to the **language**, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ This report is based on translations from the original language into the following language, which is the language of a translation furnished for the purposes of:
- ☐ international search (under Rules 12.3 and 23.1(b))
  - ☐ publication of the international application (under Rule 12.4)
  - ☐ international preliminary examination (under Rules 55.2 and/or 55.3)
2. With regard to the **elements\*** of the international application, this report is based on *(replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report)*:

**Description, Pages**

1-5 as originally filed

**Claims, Numbers**

1-29 as originally filed

- ☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing
3. ☐ The amendments have resulted in the cancellation of:
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):
4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).
- ☐ the description, pages
  - ☐ the claims, Nos.
  - ☐ the drawings, sheets/figs
  - ☐ the sequence listing (*specify*):
  - ☐ any table(s) related to sequence listing (*specify*):

\* If item 4 applies, some or all of these sheets may be marked "superseded."

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**Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement**

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1. Statement

Novelty (N)	Yes: Claims	1-29
	No: Claims	
Inventive step (IS)	Yes: Claims	1-21
	No: Claims	22-29
Industrial applicability (IA)	Yes: Claims	1-29
	No: Claims	

2. Citations and explanations (Rule 70.7):

**see separate sheet**

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**Box No. VIII Certain observations on the international application**

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The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

**see separate sheet**

**Re Item V**

**Reasoned statement with regard to novelty, inventive step or industrial applicability;  
citations and explanations supporting such statement**

Reference is made to the following documents:

- D1: LOEF VAN E V D ET AL: "Scintillation and spectroscopy of the pure and Ce<sup>3+</sup>-doped elpasolites: Cs<sub>2</sub>LiYX<sub>6</sub> (X=Cl, Br)" JOURNAL OF PHYSICS: CONDENSED MATTER, BRISTOL, GB, vol. 14, 19 September 2002 (2002-09-19), pages 8481-8496, XP002276583
- D2: A. N. MISHIN ET.AL.: "Search for new scintillators for x- and gamma-ray detectors" PROCEEDINGS OF SPIE, vol. 4348, 2001, pages 47-51, XP002325662
- D3: RODNYI P A: "Progress in fast scintillators" RADIATION MEASUREMENTS, ELSEVIER SCIENCES PUBLISHERS, BARKING, GB, vol. 33, no. 5, October 2001 (2001-10), pages 605-614, XP004299798 ISSN: 1350-4487

The present application meets the criteria of Article 33(1) PCT, because the subject-matter of claims 1-29 is new in the sense of Article 33(2) PCT for the following reason:  
None of the cited documents discloses neither a neutron detector comprising as scintillating material Cs<sub>(2-z)</sub>Rb<sub>z</sub>LiLn<sub>(1-x)</sub>X<sub>6</sub>: Ce<sup>3+</sup> with X= Br, J, Ln=Y, Gd, Lu, Sc, La, and z≥0 or =2 and x>0.0005, nor is the material per se disclosed.

The present application meets the criteria of Article 33(1) PCT, because the subject-matter of claims 1-21 involves an inventive step in the sense of Article 33(3) PCT.  
The underlying problem to be solved can be seen in how to provide an a neutron detector with a scintillating material which has a fast decay time to neutrons. The solution is given in claims 1 and 11.

Document D1 discloses scintillating material of Cs<sub>2</sub>LiYCl<sub>6</sub>:Ce and Cs<sub>2</sub>LiYBr<sub>6</sub>:Ce, but no indication is given for a possible application in neutron detectors (p.8481-8494). The same applies for the documents: D2 discloses Cs<sub>2</sub>LiYBr<sub>6</sub>:Ce, Cs<sub>2</sub>LiLaCl<sub>6</sub>:Ce (p.47-51), and D3 refers to Cs<sub>2</sub>LiLaCl<sub>6</sub>:Ce (p.605-612).

For this reason, claims 1-20 are acknowledged to involve an inventive step.

Claim 21 is considered to involve as well an inventive step, because no indication are given in the prior art, that the scintillating material of general formula  $\text{Cs}_{(2-z)}\text{Rb}_z\text{LiLn}_{(1-x)}\text{X}_6\text{:Ce}^{3+}$  could also work only with Rb instead of only Cs.

The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 22 does not involve an inventive step in the sense of Article 33(3) PCT.

The underlying problem to be solved is seen in providing a scintillating material. The solution given by claim 22 is  $\text{Cs}_{(2-z)}\text{Rb}_z\text{LiLn}_{(1-x)}\text{J}_6\text{:Ce}^{3+}$  with  $\text{Ln}=\text{Y, Gd, Lu, Sc, La}$ , and  $z \geq 0$  or  $=2$  and  $x > 0.0005$ .

As already disclosed above, in D1 and D2  $\text{Cs}_2\text{LiYBr}_6\text{:Ce}$  is disclosed. The only difference to the material in claim 23 is the use of jodide instead of bromide. Although the anion jodide has a bigger diameter as bromide, no surprising effect is to be expected in exchanging these to anions; further it is a common practice for a skilled person in the art, to provide such variations.

Dependent claims 23-29 do not contain any features which, in combination with the features of any claim to which they refer, meet the requirements of the PCT in respect of inventive step, see documents D1-D3 and the corresponding passages cited in the search report.

#### **Re Item VIII**

No examples are given in the description for the scintillating material comprising jodide as anion. (Art. 5 PCT)